

NOTES ON AUSTRALIAN MARINE ALGAE.

IV. THE AUSTRALIAN SPECIES OF THE GENUS SPONGOCLONIUM.

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(Plates xxvii-xxxv.)

[Read 28th September, 1927.]

In his Synoptic Catalogue of Australian and Tasmanian Algae, published in the concluding volume of *Phycologia Australica*, 1863, Harvey ranked fifty species, divided into seven sections, under Lyngbye's genus *Callithamnion*. In De Toni's *Sylloge Algarum* only nine of these are retained in *Callithamnion*. The rest have been drafted into the genera *Chantransia*, *Spermothamnion*, *Monospora*, *Spongoctonium*, *Warrenia*, *Antithamnion*, *Lasiothalia* and *Thamnocarpus*.

Harvey defined his Section 1, *Dasythamnion*, as including species with rather large fronds, stupose-spongiose, the stem and branches more or less covered with a veil of decurrent threads, intricate, free and anastomosing. The plants of this section have been divided between two genera, *Spongoctonium* and *Lasiothalia*, the former ecorticate and the latter corticated. Both have the characteristic cystocarps and sporangia of *Callithamnion*.

The history of the two genera has been somewhat remarkable. Both were proposed in 1854 almost simultaneously, so that it is apparently impossible to decide which may claim priority. *Spongoctonium* was proposed by Sonder, *Linnaea* xxvi, p. 515 on a specimen which he called *S. conspicuum*, and *Lasiothalia* by Harvey, *Trans. Roy. Irish Acad.*, xxii, p. 558, "founded on a very imperfect and battered scrap" (Harvey), which he called *L. hirsuta*.

In the *Flora of Tasmania*, 1860, Harvey gives a description of *Callithamnion conspicuum* Harv. and appends the comment: "Since this was written, I have ascertained that my *C. tingens* is the same as Sonder's *Spongoctonium conspicuum*, which name will be adopted if the plant be removed from *Callithamnion*. Another synonym is my *Lasiothalia hirsuta*, founded on a very imperfect and battered scrap of what I afterwards called *Callithamnion tingens* when more perfect specimens were collected". Presumably he called the species *C. conspicuum* Harv. because he as yet retained it in *Callithamnion*.

Of his *C. conspicuum*, which we see he identified with Sonder's plant, Harvey writes in the *Flora of Tasmania*: "The habit of this species is peculiar, and perhaps, with *C. plumigerum* and *C. superbiens*, it might form a separate genus, characterized by the peculiarly inarticulate and hirsute stem. But there are many intermediate links with species of more ordinary characters".

Sonder seems to have acquiesced in the inclusion of his species in *Callithamnion*, as in his enumeration of Australian Algae he drops *Spongoctonium* and lists his plant as *C. conspicuum*.

It might seem then that the matter was definitely settled, that but one species existed, and that the two authors had withdrawn their genera, leaving the plant

in question in the mother genus *Callithamnion*. But J. G. Agardh (*Analecta Algologica*, 1892) voiced his doubt of the identity of the species. His grounds appear somewhat slender. He says that Harvey, writing of *Lasiothalia*, says that the plant but slightly adheres to paper; Agardh's specimens (probably distributed by Harvey as *C. tingens*) adhered so closely that he could scarcely separate the least fragment, and he suggests that Harvey's name *hirsuta* of itself seemed to point to another plant. De Toni, in *Sylloge Algarum*, iv, 1903, on the other hand, regards *S. conspicuum* Sond., *C. conspicuum* Harv., *C. tingens* Harv. and *Lasiothalia hirsuta* Harv. as being synonymous, and, acting on Harvey's suggestion given above, adopts the Harveyan genus *Lasiothalia* incorporating in it *L. hirsuta* and the three Harveyan species *C. plumigerum*, *C. formosum* and *C. superbiens*.

In 1892 (*Analecta Algologica*) Agardh resuscitated Sonder's genus *Spongoclonium*, incorporating in it the Harveyan *Callithamnion brownianum*, *C. wollastonianum*, *C. dasyurum*, *C. formosum*, and adding a new species, *S. wilsonianum*, but curiously left Sonder's type species amongst the *Callithamnia* as *C. conspicuum*. If then, as Agardh thought, *S. conspicuum* and *L. hirsuta* are not identical, the former has found no resting place in the *Sylloge Algarum*.

If the type species of a genus, the only species recognized by the author of the genus, is removed from it, it would seem that the genus lapses. Agardh does not seem to be justified in remodelling the genus without including in it *S. conspicuum*. He considered that *C. tingens* was a different plant, but still did not retain *S. conspicuum*. From material which I have gathered I believe that Agardh was right, that there are two species, that *C. tingens* is distinct from Sonder's plant, and I propose to retain *S. conspicuum* with his description in the genus *Spongoclonium* Sonder, the retention of which is thus justified.

In 1894 (*Analecta Algologica* contd.) Agardh took into *Spongoclonium* Harvey's *C. plumigerum* and added two new species of his own, *S. fasciculatum* and *S. scoparium*. R. M. Laing (*Trans. N.Z. Inst.*, xxxvii, 1905) contributed two fresh species from New Zealand, *S. pastorale* and *S. brachygonum*.

In *Sylloge Algarum*, iv, 1903, De Toni enlarged the genus *Spongoclonium* by adding to it the Harveyan *C. latissimum*,* *C. angustatum*, *C. hirtum** (from New Zealand), *C. violaceum*,* *C. dasytrichum** (from Rio de Janeiro), *C. scopula*, *C. paradoxum*,* *C. crispulum** and *C. debile*,** together with Suhr's *C. stuposum** (from the Cape of Good Hope). The species bearing the asterisk he marks as doubtful *Spongoclonia*. At the same time he removed *S. plumigerum* and *S. formosum* from the genus transferring them to *Lasiothalia*.

The critical distinction between *Spongoclonium* and *Lasiothalia* seems to be that the former is monosiphonious, articulated, without any true cortex, and thus nearer to *Callithamnion*, while the latter possesses a true cortex, and is nearer to *Crouania*.

The object of the present paper is to illustrate as far as material will permit the Australian and Tasmanian species included by De Toni in the genus *Spongoclonium*.

It must be admitted that of several of the species the material for investigation is scanty. Some are not represented in any of the Australian Herbaria and others but slightly. Many occur but rarely, and have eluded diligent search in the localities whence they have been recorded. The paper aims to set forth our present knowledge so that the gaps can be clearly recognized. It is based on the material existing in the Melbourne and Sydney Herbaria and that which I have accumulated from the coasts of Victoria and Tasmania.

I wish to acknowledge with gratitude the courtesy and kind help which Messrs. Audas and Morris, of the Melbourne Herbarium have shown me, and to thank the Curators of the Melbourne and Sydney Herbaria for permission to publish photographs of specimens in their Herbaria.

SPONGOCLONIUM Sonder.

"Frons teres, rosea, spongiosa, pinnatim decomposita, contexta filis articulatis callithamnoideis ramosis anastomosantibus, a tubo centrali articulado egredientibus, exterioribus vel periphericis laxis secundatim ramulosis ramulis incurvis liberis. Sphaerosporae sphaericae triangule quadridivisae, in ramulis periphericis latere inferiore evolutae, solitariae vel seriatiae, pedicellatae, pedicello simplici vel subdiviso.

"Genus habitu fere *Ptilocladiae*, sed fronde tereti molliori non regulariter distiche pinnata, praeterea filis periphericis liberis subincurvis secundato-ramulosis non ut in *Ptilocladia* densis fastigiatis stratumque periphericum efficientibus diversum. Ab *Haloplegmate*, cui filis exterioribus liberis et substantia molli spongiosa affine, facile distinguitur frondi tereti pinnata et axi centrali articulado". Sonder, *Linnaea*, xxvi, p. 515, 1854.

Agardh (*Analecta Algologica*, p. 39, 1892) gives this amended description of *Spongoclonium*.

"Frons articulata monosiphonia, initio et superne nuda alterne pinnatim decomposita, mox filis a ramorum basi extra cuticulam secus frondem descendentibus subfuniculariter contortis et anastomosantibus inferne stuposa, stupa nunc fere nuda, nunc hirta, nunc dense ramellis cooperta et spongiosa. Favellae ad apices ramulorum subterminales, involucre ramellis plurimis incurvatis constante circumcirca obtectae, plures circa rachidem tabescentem dispositae, singulis saepe bracteatis, in eundem nidum conjunctae; nucleis minoribus rotundatis gemmidia plurima rotundato-angulata intra periderma hyalinum foveantibus. Sphaerosporae inferiore latere ramulorum paucae (aut saepe plures seriatiae), a singulis articulis transformatae, triangule divisae.

"Quale sub-genus *Dasythamnii* inter *Callithamnia* limitibus circumscriptis Harvey, genus autem proprium nomine *Spongoclonii* a Sondero institutum fuit".

Here we have the idea of an alternately pinnately decompound *Callithamnion*, which covers the axis of its stem and branches to a variable height with a growth of descending radicles which interweave into a close tegumentum; the cystocarps protected by an involucre of several small incurved branches; the sporangia, few or seriate, divided into tetrads.

Agardh has added the character of the cystocarps, and does not postulate that the sporangia be pedicellate.

We now give our working definition in the light of further investigation and so as to include *S. conspicuum*.

SPONGOCLONIUM Sonder.

Sonder, *Linnaea*, xxvi, p. 515, 1854; J. G. Agardh, *Anal. Algol.*, p. 39, 1892; Engl. and Prantl, *Natürl. Pflanzenfam.*, p. 491, 1897; De Toni, *Sylloge Algarum*, iv, p. 1357, 1903.

Frond erect, rounded, with alternately pinnate primary branches of unequal length, spreading in all directions; these bear similarly ramulose secondary branches, the whole frond being thus pinnately decompound. The lower cells of the branches emit much branched radicles, which becoming decurrent clothe the main stem and branches with a spongy network, at all events in the inferior

part of the plant. A central monosiphonious articulated axis is continuous throughout the stem and branches, ecorticate but invested below by the descending radicles and their branches.

Cystocarps numerous, scattered over the outer filaments of the frond, situated outside the close reticulum among the looser ramelli but with no proper involucre. The nucleus consists of a single gonimoblast divided in successive evolution into numerous globose-rounded few-celled gonimoblasts.

Sporangia shortly pedicellate or sessile, few or seriate, growing on the inner side of penultimate or ultimate filaments, divided into tetrads.

Antheridia thyrsoid.

Sections.

The species fall naturally into two sections with quite different aspects.

Section 1. *Conspicuae*.

The stem and greater part of the branches stupose-spongiose, formed of intricate funicular descending radicles, only the terminal plumules free and articulate.

S. conspicuum.
S. fasciculatum.
S. brownianum.
S. wollastonianum.
S. wilsonianum.
S. dasyurum.
S. paradoxum.

Section 2. *Violaceae*.

Only the lower part of stem and branches funicularly intricate, the greater portion of the frond free and articulate.

S. latissimum.
S. angustatum.
S. violaceum.
S. scopula.
S. scoparium.

We propose to exclude from the genus and to restore to *Callithamnion* the species—

S. (?) crispulum (Harv.) De Toni.
S. (??) debile (Harv.) De Toni.

Section 1. CONSPICUAE.

S. CONSPICUUM Sonder.

Linnaea, xxvi, p. 515, 1854.

Specimen 4 inches high, lacking the attachment. Primary frond terete, half a line wide, bipinnately branched. Branches for the most part distichous, mingled with some arising irregularly from the frond, subhorizontally patent, narrower by half than the caulis, the lower about an inch long, the upper longer, about 2 inches in length, all alternate with pinnae, 2-4 lines long. *Sphaerospores* on the inner side of subarcuate filaments, now solitary, now longitudinally seriate; on a short 1-2 jointed or a longer 4-6 jointed, simple or sub-branched, pedicel, spherical, the nucleus triangularly divided. Frond spongy, rose-sanguineous. A central axis monosiphonious, articulate, persisting through the whole frond, at the genicula beset with callithamnoid branching and anastomising threads, free towards the surface. Joints of the central axis 3-4 times as long as the diameter, of the ramelli twice as long.

Habitat.—Cape Liptrap, June, 1853.

S. FASCICULATUM J. Ag. (Plate xxvii.)

Anal. Algol. contd., p. 118, 1894.

Frond elate, to 26 cm., stout, caulescent, pinnately decomposed; primary branches alternate at distances of about 5 mm., pyramidal, rather patently ascending; branches of the second order, pinnae, 20 mm. long, emitted alternately at rather shorter distances, similarly patently ascending; ramuli of the third order, soft, fasciculate, with capillary ramelli, the ultimate branches of which are somewhat distant, ultra-capillary and but slightly diverging. The stem, primary and secondary branches are densely clothed by the intricate web of the ramelli which they emit. The secondary branches incurve towards the axis on which they grow.

The joints of the upper parts of the axis are 2-4 times as long as the diameter, those of the felted ramelli are often much shorter, even falling to half the diameter.

The colour of the fascicles is bright rose, of the felt covered stem and branches rusty brown.

Cystocarps "several among the fascicles and confluent into a conspicuous node" (J. Agardh).

Sporangia not seen.

Antheridia numerous, oblong, sessile, borne on the upper branches of the ramelli.

Habitat.—Port Phillip Heads and Western Port (Wilson). Apparently very rare. The antheridia-bearing specimen described and figured is in the Melbourne Herbarium. It is the only example we possess in Australian Herbaria.

S. BROUNIANUM (Harv.) J. Ag. (Plates xxviii and xxix.)

Callithamnion brounianum Harv., *Trans. Roy. Irish Acad.*, xxii, p. 561, 1854.

Frond elate—in the Western Australian forms, first described by Harvey, to 10 cm., in those afterwards obtained by him from Western Australia and Port Fairy to 30 cm.—caulescent, pinnately decomposed; primary branches alternate, spreading, to 10 cm. long, with lateral divisions often as thick as the main axis; secondary branches arising from these or from an undivided primary, to 2 cm. long, bearing alternately at very short intervals the fascicles of the last order. The stem and primary and the basal parts of the secondary branches densely stipose, invested by a close felt of squarrose-pilose alternately pinnate ramelli derived from descending radicular branches. A continuous ecorticate articulated axis persists through stem and branches. The joints in the lower portions about as long as the diameter, in the ramelli very variable, short to twice the diameter. The divisions of the ramelli copious, pinnate, capillary, the upper incurved.

Colour of the plumules deep rose red, of older axes paler and browner.

Cystocarps "nidulating among the ramelli below the corymbs" (De Toni).

Sporangia numerous, seriate on the inner side of the lower parts of the ramelli, very shortly pedicellate or almost sessile, with clear spherical envelope, dividing into tetrads.

Habitat.—Fremantle (Clifton), King George's Sound, Port Fairy, Queenscliff (Harvey), Port Phillip Heads (Wilson).

Cystocarpiferous plants seem to be rare.

R. M. Laing, *Trans. N.Z. Inst.*, xxxvii, pp. 392, 393, 1905, describes a form *Pleonosporium brounianum* Harvey Gibson from New Zealand, which he identifies with the Australian *Callithamnion brounianum* Harvey. In the New Zealand plants the sporangia are pear-shaped and develop 8, 16 or 32 radially arranged

spores, and hence Laing transfers the species to the genus *Pleonosporium*. In our plants the sporangia are spherical, and when mature divide each into a tetrad of spores. This I have fully verified in specimens distributed by Harvey in his *Algae Australicae Easiccatae*. Laing also places the New Zealand species *C. hirtum* H. and H. in *Pleonosporium* from the sporangia, and thinks that the tetrad sporangia figured by Harvey in *Flora Antarctica*, t. 78, are explained as being derived from some other plant. It would seem then that *Spongoclonium brounianum* is not known to occur in New Zealand, and that *S. hirtum* is really a *Pleonosporium*.

S. WOLLASTONIANUM (Harv.) J. Ag.

Callithamnion wollastonianum Harv., *Trans. Roy. Irish Acad.*, xxii, p. 561, 1854.

No example of this plant exists in any of our Australian Herbaria. The following is derived from Harvey's original description, supplemented from the description in the *Sylloge Algarum*.

Fronde elate, caulescent (according to Harvey, ultrasetaceous), 10 to 14 cm. high, thinly corticate at the base, the stem for a long distance upwards stipose-hairy with squarrose pile derived from radicles descending from the basal joint of superior branches, sub-distichously freely branched, the branches alternately pinnately decompose, those of the last order distichous, pellucidly articulate, alternately plumulate, the plumules very long, linear in outline; the pinnae slender patent (rather erect, Harvey) short, the inferior simple, the superior more often forked or pinnulate. The joints 2-4 times as long as the diameter (Harvey), of the branches $1\frac{1}{2}$ times (De Toni, *Sylloge*).

Cystocarps and *Antheridia* not noted.

Sporangia solitary along the ramelli, very shortly pedicellate.

Habitat.—Middleton Bay, King George's Sound, rare (Harvey).

S. WILSONIANUM J. Ag. (Plate xxx.)

Anal. Algol., p. 42, 1892.

Fronde elate, 10 to 15 cm. high, caulescent, alternately pinnately decompose; primary branches spreading in all directions, to 10 cm. long; secondary emerging at short intervals, patent, distichous, plumose, lanceolate in outline, to 15 mm. long, bearing tertiary alternate, distichous, plumulose ramelli, 1 or 2 mm. long; the stem and rachides of the primary and even of the secondary branches densely clothed with an intricate felt of the segments of ramelli of slender descending radicles; a continuous ecorticate monosiphonious axis persists through stem and branches, the joints throughout about equalling the diameter in length, the copious divisions of the ramelli all alternately pinnate, capillary, the upper incurved.

Colour a dull red, of older rachides brown.

Cystocarps and *Antheridia* not observed.

Sporangia numerous, nidulating within the free plumules, borne laterally on the lower joints of the ramelli, subpedicellate, spherical, divided into tetrads.

Habitat.—Port Phillip Heads (Wilson).

It will be seen that these four species conform to Sonder's conception of the genus, that they are all very closely related and form a very natural group. Harvey was at first doubtful whether or not to include the smaller and the larger plants he found in the one species *S. brounianum*, but finally combined them. Of the other three very few examples have been found, *S. fasciculatum* and

S. wilsonianum only in Wilson's dredgings, while of *S. wollastonianum* we have no specimen in Australian Herbaria.

The habit of *S. fasciculatum* differs from that of the others, the branches in these are spreading, in *S. fasciculatum* distinctly ascending. The terminal ramuli in the latter are fasciculate, and the segments more finely capillary and longer and more erect and possess longer joints. *S. wilsonianum* is more delicate than *S. brounianum*, with feather-like plumules in contrast with the more brush-like pinnules of *S. brounianum*. Of *S. wilsonianum* De Toni remarks that it is very near *S. wollastonianum* but larger and in every respect more evolved. I take the latter to mean more decomposed.

S. DASYURUM (Harv.) J. Ag. (Plate xxxi.)

Callithamnion dasyurum Harv., *Synoptic Catalogue*, p. 51, 1863.

Fronde elate, to 22 cm. high, alternately distichously pinnate-decompound, the pinnae and pinnules ascending virgate, most of the plant spongiöse-stupose, with decurrent interwoven threads and even the smaller ramelli in the same way hairy, the pinnules scarcely stupose alternately closely plumulate, the plumules minute oblong pectinate-pinnate. Their pinnellae elongate incurved, simple or ramuliferous at the base; all joints very short. Colour intensely red.

Cystocarps, *Sporangia*, *Antheridia* not seen.

Habitat.—Port Phillip Heads (Harvey).

There are no specimens in the Melbourne Herbarium, and but one in that of Sydney, Harvey's No. 508E. This, the one figured, gives the appearance of a much denuded plant, the plumules being very weakly developed, and adhering so closely to the paper that it was impossible to dissect them under the microscope.

S. PARADOXUM (Harv.) De Toni. (Plate xxxii.)

Callithamnion paradoxum Harv., *Flora of Tasmania*, ii, p. 337, 1860.

Fronde terete, decomposed pinnate, branches and branchlets spreading in all directions, the main branches pyramidate in contour, the rachides stout below, gradually attenuate, all except the ultimate plumules densely spongy, formed of closely interwoven descending filaments; the surface of the frond consisting of the crowded pinnae of penultimate order, the lower branches of these greatly elongated, the upper markedly flexuose with distichous segments ending in blunt apices. The joints are three or four times longer than the diameter in the lower part of the frond, not much longer than the diameter in the ultimate free ramelli.

Colour.—A rich dark plum colour.

Cystocarps and *Antheridia* not seen.

Sporangia numerous, sessile, seriate on the upper or inner side of the ramelli near the surface of the plant, rather large, 62 μ in diameter,

Habitat.—Warrnambool (H. Watts), Sandringham, Port Phillip (Lucas); Tasmania, Brown's River (Gunn), estuary of the Derwent River and Orford (Lucas).

It is very abundant in the Lower Derwent. I have gathered many sporangiferous plants but was never fortunate to discover cystocarps.

De Toni placed this species in the genus with some doubt. It seems to me to fall under Sonder's definition admirably. It is the most clearly marked of all the species.

Section 2. VIOLACEAE.

S. LATISSIMUM (H. and H.) De Toni. (Plate xxxiii.)*Callithamnion latissimum* H. and H., *London Journal of Botany*, iv, p. 452, 1845.

Fronde elate, caulescent, spreading pinnately decomposed, 8 to 12 or even to 25 cm. high and to equally broad; primary branches alternate, beset with very slender, repeatedly divided pinnae; the stem and main branches, primary and secondary, far upwards stupose-hairy from radicles descending from the basal joint of the next superior segment; a monosiphonious axis is continuous throughout the branching forming the design of the plant, entirely ecorticate but surrounded below by an intricate investiture of the radicles and their branches; all the free tertiary pinnules plumulose, much and finely divided, the ramifications throughout alternately pinnate.

Colour of the plumules rosy in young and sterile plants, duller and even a dark purple in fruiting plants, of the felted rachides brown.

Cystocarps single, terminal on short segments, involucreted by inferior incurved ramelli.

Sporangia spherical, about 35μ in diameter, numerous, distinctly pedicellate, the pedicel unicellular nearly or quite as long as the diameter of the sporangium, often subserrate second on the inner side of the ramelli, forming tetrads.

Antheridia not observed.

Habitat.—Tasmania, especially in the Tamar River (Gunn, Harvey, Fereday, Lucas), Port Phillip (Wilson, less luxuriant, Lucas).

S. ANGUSTATUM (H. and H.) De Toni. (Plate xxxiv, fig. 1.)*Callithamnion angustatum* H. and H., *Flora of Tasmania*, ii, p. 334, 1860.

Fronde elate, to 12 cm. high, pinnately decomposed, below funicularly contorted and somewhat stupose with radicles descending the rachis from the basal joints of the larger branches, and above and in greater part emitting free and very flaccid branches; the branches soft, in all directions pinnate, the pinnae, on an elongated axis with rather naked protruding apex, alternate, conspicuously attenuated from the base, the lowest pinnae of the larger branches subrecurved, the upper short patent; the joints four times as long as the diameter.

Colour a bright rose-red, brighter and lighter than in *S. latissimum*.

Cystocarps geminate, involucreted by subumbellate ramelli of unequal length.

Sporangia scattered on the ramelli, quite sessile, divided into tetrads.

Antheridia not observed.

Habitat.—Tasmania, Georgetown (Harvey), Tamar River, Ulverstone. D'Entrecasteaux Channel (Lucas), Port Phillip Heads (Wilson); grows on other algae.

The slender stem and primary branches are usually quite inconspicuous, and hence difficult to trace amidst the superabundance of ramuli of secondary and higher orders. In a cystocarpiferous plant from Ulverstone, however, they were as conspicuous as in the upper regions of *S. latissimum*. The larger branches are funicularly contorted and give off radicles, the radicle now passing down the stem from the basal joint of a branch, now formed from the lower pinnules of the branches.

The cystocarps opposite geminate, on a smaller ramus below the persisting apex, are surrounded by a sort of involucre of subumbellate unequal ramelli, several of the latter acuminate with shorter joints.

The habit is quite that of *Callithamnion*.

S. VIOLACEUM (Harv.) De Toni. (Plate xxxiv, fig. 2.)

Callithamnion violaceum Harv., *Flora of Tasmania*, ii, p. 334, 1860.

"Caespitose, purple, fronds capillary, stupose at the base to a considerable height with radicular threads interwoven into cords, pellucidly articulate decomposed pinnate; the branches in all directions pinnate at the base bipinnate at the apex, pinnate with simple plumules, pinnules patent filiform elongate; joints of the rami six times, of the ramuli three times, as long as the diameter; tetraspores sessile on the pinnules, subsolitary, globose.

"A small species 2-3 inches high. The principal branches are bundled together into ropes, and then closely interwoven by root-like fibres, which issue from the nodes, and proceed downwards along the stem, forming an accessory stupose stratum. The branches are alternately pinnate below, and bipinnate above, all the pinnules remarkably patent and elongate. Tetraspores are thinly scattered on the inner faces of the pinnules".—(Harvey.)

Colour a dull purple.

Cystocarps geminate with no involucre of ramelli (Lucas).

Antheridia not observed.

Habitat.—Tasmania: Georgetown (Gunn, Harvey), abundant in the Derwent Estuary (Lucas).

Specimens found by Gunn, much larger, with stronger and shorter ramuli of rather shorter joints, may, in the opinion of De Toni, constitute a distinct species. I have had no opportunity of seeing Gunn's specimens, nor have I gathered forms of the kind.

S. SCOPULA (Harv.) J. Ag.

Callithamnion scopula Harv. *Trans. Roy. Irish Acad.*, xxii, p. 562, 1854.

Frond small, an inch high, below funicularly contorted and rooting, at length stupose at the base, above terminated in free fascicles of branches, the greater branches gradually on all sides porrect pinnate, the pinnules subdistichous rather simple elongate, curved, the lower subhorizontal recurved, the upper patent, joints $2\frac{1}{2}$ times as long as the diameter.

Cystocarps and *Antheridia* not seen.

Sporangia elliptical, sessile, scattered among the pinnules.

Habitat.—Rottnest Island, Fremantle (Harvey).

We have no specimens in Australian Herbaria, but the plant would appear to be a smaller Western Australian representative of the Tasmanian *S. violaceum*.

S. SCOPARIUM J. Ag.

Anal. Algol. contd., i, p. 117, 1894.

Frond caespitose-rounded, expanded in every direction, composed of branches repeatedly fasciculately divided, the branches radiating above a stipes less conspicuously funicularly compound, branches and branchlets issuing on all sides erect-patent, rather rigid, of unequal length, joints slightly contracted at the dissepiments usually three or four times as long as the diameter. No fruits seen. The bushy fronds stout, measuring 10 cm. in expansion.

Habitat.—Western Port (Wilson), Orford, Tasmania (Mrs. Meredith).

We have no examples in the Australian Herbaria. There seems but little in this meagre description to separate the species from *S. violaceum* from the same region. Is it the same thing as Gunn's larger form of *S. violaceum*?

To be excluded from the genus *Spongoclonium*.

CALLITHAMNION DEBILE HARV. (Plate xxxv, fig. 1.)

Trans. Roy. Irish Acad., xxii, p. 563, 1854; *Spongoclonium* ?? *debile* (Harv.) De Toni, *Sylloge Algarum*, iv, 1903.

Fronde small, caespitose, scarcely an inch high, ultracapillary, decomposed pinnate, the lower branches giving off ramuli on all sides, the upper distichously pinnulate, the pinnules very patent, inferior articuli 5-8 times, and those of the ramuli 3-4 times, as long as the diameter.

Colour purpurascens.

Cystocarps and *Antheridia* not seen.

Sporangia solitary, sessile on the ramuli (Harvey).

Habitat.—Rottneest Island, Fremantle (Harvey), "In shady crevices of rocks at half-tide level".

There are specimens in the Melbourne and Sydney Herbaria, distributed by Harvey. The specimen figured, named by Harvey, was gathered by himself at Geelong. De Toni states that he had not seen authentic plants. Examples of the genuine Western Australian plant are needed.

CALLITHAMNION CRISPULUM HARV. (Plate xxxv, fig. 2.)

Trans. Roy. Irish Acad., xxii, p. 562, 1854; *Spongoclonium* (?) *crispulum* (Harv.) De Toni, *Sylloge Algarum*, iv, 1903.

Fronde small, caespitose, 1-3 cm. high (half to three-quarters of an inch, Harvey), decomposed pinnate, with few pyramidal capillary branches bearing short crowded pinnules, the whole ecorticate and nowhere spongy, but with simple *Callithamnion* structure. From the stem, and from the same articulus, in a very few cases a branch proceeds upwards and a simple elongate free arcuately curved radicle hangs downwards. These radicles at first of the colour of the plumules, and with joints of the same length, become hyaline as they descend and the joints become longer. The plumules are alternately distichously pinnulate, the pinnules simple, elongate, incurved, the lower patent, the upper corymbose, the joints one and a half times as long as the diameter.

Colour dull red.

Cystocarps geminate (Harvey).

Sporangia and *Antheridia* not seen.

Habitat.—Rottneest Island, Fremantle (Harvey). Both Melbourne and Sydney Herbaria possess specimens distributed by Harvey.

The presence of occasional free radicles does not at all seem to warrant the inclusion of this well marked plant in Sonder's *Spongoclonium*, and it would, I think, be best left in *Callithamnion*.

EXPLANATION OF PLATES XXVII-XXXV.

Plate xxvii.

Spongoclonium fasciculatum. Bearing antheridia. Western Port (Wilson). Melbourne Herb.

Plate xxviii.

Spongoclonium brownianum. Bearing tetrasporangia. Port Phillip Heads (Wilson) Melbourne Herb.

Plate xxix.

Spongoclonium brownianum. Fremantle (G. Clifton). Melbourne Herb.

Plate xxx.

Spongoclonium wilsonianum. Port Phillip Heads (Wilson). Melbourne Herb.

Plate xxxi.

Spongoclonium dasyurum. Harvey, Alg. Austral. Exsicc. Sydney Herb.

Plate xxxii.

Spongoclonium paradoxum. Orford, Tasmania (Lucas).

Plate xxxiii.

Spongoclonium latissimum. Tasmania. Melbourne Herb.

Plate xxxiv.

1. *Spongoclonium angustatum*. Georgetown, Tasmania (Harvey).
2. *Spongoclonium violaceum*. Derwent River, Tasmania (Lucas).

Plate xxxv.

1. *Callithamnion debile*. Geelong (Harvey). Melbourne Herb.
 2. *Callithamnion crispulum*. Fremantle (Harvey). Melbourne Herb.
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